Topic: STATISTICS 2 – PRESENTATION OF DATA

Types of Presentation

Good **presentation** can make statistical data easy to read, understand and interpret. Therefore it is important to present data clearly.

i. There are two main ways of presenting data: presentation of numbers or values in **lists** and **tables;**

ii. Presentation using **graphs,** i.e. picture. We use the following **Example**s to show the various kinds of presentation.

An English teacher gave an essay to
15 students.

She graded the essays from A (very good), through B, C.D, E to f (very poor). The grades of the students were:

B, C, A, B, A, D, F, E, C, C, A, B, B, E, B

Lists and tables

Rank and order list

Rank order means in order from highest to lowest. The 15 grades are given in rank order below:

A, A, A, B, B, B, B, C, C, C, E, E, F

Notice that all the grades are put in the list even though most of them appear more than once. The ordered list makes it easier to find the following: the highest and lowest grades; the number of students who got each grades; the most common grade; the number of students above and below each grade; and so on.

Frequency table

Frequency means the number of times something happens. For **Example**, three students got grade A.

The frequency of grade A is three. A **frequency table,** gives the frequency of each grade.

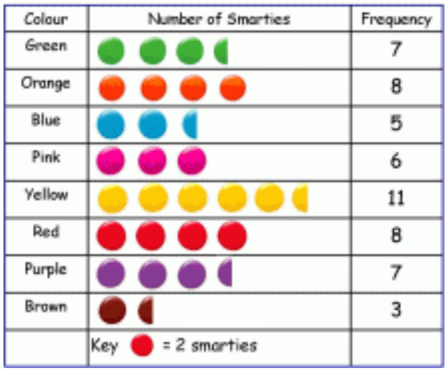
Grade	**A**	**B**	**C**	**D**	**E**	**F**
frequency	3	5	3	**1**	2	1

Graphical Presentation

In most cases, a picture will show the meaning of statistical data more clearly than a list of or table or numbers. The following methods of presentation give the data of the **Example** in picture,
or **graph,** form.

Pictogram

A **pictogram** uses pictures or drawings to give a quick and easy meaning to statistical data.



Colour	Number of Smarties	Frequency
Green		7
Orange		8
Blue		5
Pink		6
Yellow		11
Red		8
Purple		7
Brown		3
	Key = 2 smarties	

Bar chart

A bar chart represents the data as horizontal or vertical bars. The length of each bar is proportional tothe amount that it represents.

There are 3 main types of bar charts.

Horizontal bar charts, vertical bar chart and double bar charts.

When constructing a bar chart it is important to choose a suitable scale to represent the frequency.

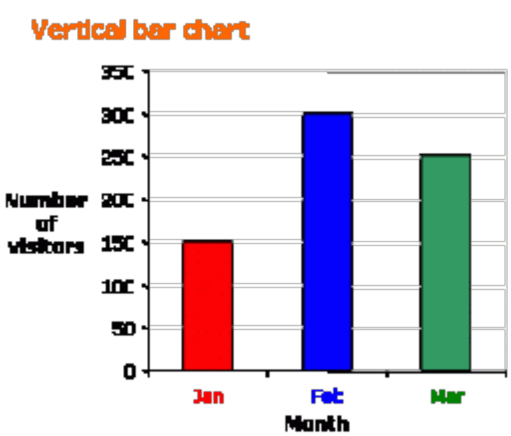
The following table shows the number of visitors to a park for the months January to March.

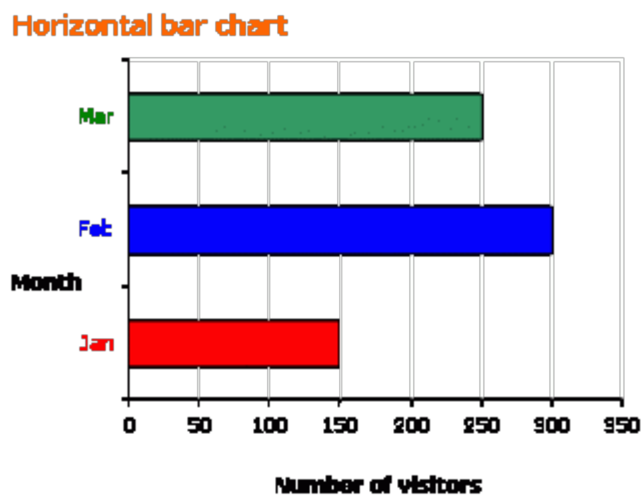
Month	January	February	March
Number of visitors	150	300	250

a) Construct a vertical and a horizontal bar chart for the table.

<u>**Solution**</u>

a) If we choose a scale of 1:50 for the frequency then the vertical bar chart and horizontal bar chart will be as shown.





Pie Chart

Pie charts are useful to compare different parts of a whole amount. They are often used to present financial information. E.g. A company's expenditure can be shown to be the sum of its parts including different expense categories such as salaries, borrowing interest, taxation and general running costs (i.e. rent, electricity, heating etc).

A pie chart is a circular chart in which the circle is divided into sectors. Each sector visually represents an item in a data set to match the amount of the item as a percentage or fraction of the total data set.

Example

A family's weekly expenditure on its house mortgage, food and fuel is as follows:

Expenses	**N**
Mortgage	300
Food	225
Fuel	75

Draw a pie chart to display the information.

Solution

The total weekly expenditure = N300 + N225 + N75 = N600

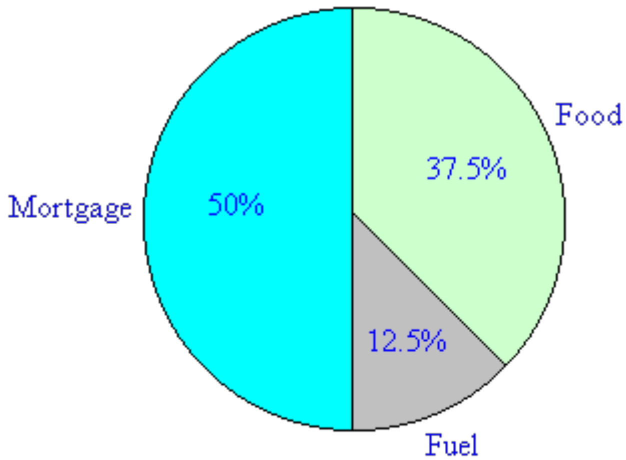
We can find what percentage of the total expenditure each item equals.

Percentage of weekly expenditure on:

Mortgage = 300/600 X 100% = 50%

Food = 225/600 X 100% = 37.5%

Fuel = 75/600 X 100% = 12.5%
To draw a pie chart, divide the circle into 100 percentage parts. Then allocate the number of percentage parts required for each item.



Note

It is simple to read a pie chart. Just look at the required sector representing an item (or category) and read off the value. For **Example**, the weekly expenditure of the family on food is 37.5% of the total expenditure measured.

A pie chart is used to compare the different parts that make up a whole amount.

Topic: PROBABILITY

Experimental Probability

A farmer asks, 'Will it rain this month?'. The answer to the farmer's question depends on three things; the months, the place where the farmer is, and what has happened in the past three months in that place. The table below gives some answers to the question for different places and months.

Place	**Month**	**Answer to question**
Sokoto	February	No
Jos	July	Ye
Ibadan	January	Maybe
Port Harcourt	June	yes

Is it possible to give a more accurate answer to a farmer near Ibadan in January? The table below shows that on average, 10mm of rain falls in Ibadan in January. However, this is an average found by keeping records over twelve years. The actual rainfall for Ibadan in January over the 12 years was as follows.

	J	F	M	A	M	J	J	A	S	O	N	D
Sokoto	0	0	0	10	48	91	155	249	145	15	15	0
Jos	3	3	28	56	203	226	330	292	213	41	3	3
Ibadan	10	23	89	137	150	188	160	84	178	155	46	10
Port Harcourt	66	109	155	262	404	660	531	318	516	460	213	81

18 mm	0 mm	17 mm	9 mm
11 mm	22 mm	14 mm	0 mm
16 mm	0 mm	7 mm	6 mm

From the above data, it can be seen that rain fell in nine of the twelve months on January. If future years follow the pattern of the past, it is likely that in Ibadan, rain will fall in nine out of the next 12 Januaries. We say that the **probability** of rain falling in Ibadan in January is 9/12 (or ¾ or 0.75 or 75%). This probability can never be exact. However, it is the best measure that we can give from the data we have. The number 9/12 is based on the experimental records. We say that it is **experimental probability**.

Example 1

A girl writes down the number of male and female children of her mother and father. She also writes down the number of male and female children of the parents' brothers and sisters. Her resuts are shown in table below.

	Number of male children	**Number of female children**
Mother and father	2	5
Mother's brother	6	8
Mother's sister	4	8
Father's brother	5	8
Father's sister	7	7
Total	**24**	**36**

a. Find the experimental probability that when the girl has children of her own, her first born will be a girl.

b. If the girl eventually has five children, how many are likely to be male?

Solution

In the girl's family there is a total of 60 children. 36 of these are female. If the girl's own children follow the pattern of her family, then the experimental probability that her first born will be a girl is 36/6 = 3/5.

b. Following the family pattern, 3/5 of the girl's children will be female and 2/5 will be male.

Number of male children that the girl is likely to have = 2/5 of 5 =2.

Notice that the results in the above **Example** are based on experimental probability. Thus we are using the past to predict the future. Events can easily turn out differently. The answers in the **Example** above are no more that calculated guesses.

Exercise

1. A woman has four children. They are all males. The children of the rest of her family are equally divided between males and females. What is the woman's next child likely to be, male or female?

2. A rainmaker throws some kola nuts n the ground. From the pattern of kola nut, he says that rain will fall next week. Is this a good method? Does it always work? Compare this method with the use of rainfall records. Can rainfall method always tell us when rain will fall?

Probability as a fraction

Probability is a measure of the likelihood of a **required outcome** happening. It is usually as a fraction: Probability = number of required outcomes/number of possible outcomes

In **Example** above, the required outcomes were female children and the possible outcomes were both male and female children. Thus probability of having a female child

= number of female children/number of male and female children

= 36/60 = 3/5 = 0.6

If we are completely sure that something will happen, the probability is 1. For **Example**, if today is Tuesday, the probability that tomorrow is Wednesday is 1.

If we are sure that something cannot happen, the probability is 0. For **Example**, the probability of rolling a 7 on a pencil is 0, because there is no number 7 in the pencil. If the probability of something happening is x, then the probability of it not happening is 1 – x. For **Example**, if the probability of it raining month is 9/12, then the probability of it not raining is 3/12.

Example

1. It is known that out of every 1 000 cars, 50 develop a mechanical fault in the first 3 months. What is the probability of buying a car that will develop a mechanical fault within 3 months?

Number of cars developing faults = 50

Number of cars altogether = 1 000

Probability of buying a faulty car = 50/1 000 = 1/20

2. A market trader has 100 hundred oranges for sale. Four of them are bad. What is the probability that an orange chosen at random is good?

‘At random means without carefully choosing’.

Either:

Four out of 100 oranges are bad, thus 96 out of 100 oranges are good.

Probability of getting a good orange = 96/100 = 24/25

or:

probability of getting a bad orange = 4/100 = 1/25

thus,

probability of getting a good orange = 1 – 1/25 = 24/25.

The next **Example** shows how to use probability when analyzing statistical data.

Example

City school enters candidates for the WASSCE. The results for the years 2004 – 2008 are given in the table below:

Year	2004	2005	2006	2007	2008
Number of candidates	86	93	102	117	116
Number gaining WASSCE passes	51	56	57	65	70

a. Find the school’s success rate at a percentage.

b. What is the approximate probability of a student at City School getting a WASSCE pass?

Solution

a. Total number of passes

= 51 + 56 + 57 + 65 + 70

= 299

Total number of candidates

= 86 + 93 + 102 + 117 + 116

= 514

Success rate as a percentage

= 299/514

=0.58 to 2.s.f.

Success rate as a percentage = 0.58 X 100% = 58%

b. The probability of a student getting a WASSCE pass = 0.58 = 0.6 to 1 s.f.

In part **b** it is assumed that the student's chances of success are the same as the school's success rate.